

WHAT IS CLAIMED IS:

1. A method of identifying peptides originating from a particular cell type and being capable of binding to MHC molecules of a particular haplotype, the method comprising:

obtaining a cell type expressing a soluble and secreted form of the MHC molecules of the particular haplotype;

collecting the soluble and secreted form of the MHC molecules of the particular haplotype; and

analyzing peptides bound to the soluble and secreted form of the MHC molecules of the particular haplotype, thereby identifying the peptides originating from the particular cell type and being capable of binding to MHC molecules of the particular haplotype.

2. The method of claim 1, wherein the cell type is a cancer cell.

3. The method of claim 1, wherein the cell type is a cancer cell line.

4. The method of claim 1, wherein the cell type is a virus infected cell or cell line.

5. The method of claim 1, wherein the cell type is a cell involved in a development and/or progression of an autoimmune diseases.

6. The method of claim 1, wherein the soluble and secreted form of the MHC molecules include a polypeptide encoded by exons 5 to 8 of a murine mutant Q10^b.

7. The method of claim 1, wherein analyzing the peptides bound to the soluble and secreted form of the MHC molecules of the particular

haplotype is by mass spectrometry, mass charge ratio and collision induced disintegration.

8. The method of claim 7, wherein analyzing the peptides bound to the soluble and secreted form of the MHC molecules of the particular haplotype is further by comparison to a protein database.

9. An electronic data storage device, storing, in a retrievable form, a plurality of sequences of peptides identified by the method of claim 1.

10. An electronic data storage device, storing, in a retrievable form, a plurality of sequences of peptides identified by the method of claim 8.

11. A kit comprising a plurality of individual containers, each of said plurality of individual containers containing at least one peptide identified by the method of claim 1.

12. The kit of claim 11, wherein at least one of said at least one peptide includes at least one modification rendering peptides more stable in a body.

13. The kit of claim 12, wherein said at least one modification rendering peptides more stable in said body is selected from the group consisting of peptoid modification, semipeptoid modification, cyclic peptide modification, N terminus modification, C terminus modification, peptide bond modification, backbone modification and residue modification.

14. The kit of claim 12, wherein at least one of said at least one peptide includes at least one modification rendering peptides more immunogenic.

15. The kit of claim 14, wherein said at least one modification rendering peptides more immunogenic is selected from the group consisting of peptoid modification, semipeptoid modification, cyclic peptide modification, N terminus modification, C terminus modification, peptide bond modification, backbone modification and residue modification.

16. A method of identifying peptides originating from at least one protein of interest and being capable of binding to MHC molecules of a particular haplotype, the method comprising:

obtaining cells co-expressing the at least one protein of interest and a soluble and secreted form of the MHC molecules of the particular haplotype;

collecting the soluble and secreted form of the MHC molecules of the particular haplotype;

analyzing peptides bound to the soluble and secreted form of the MHC molecules of the particular haplotype; and

identifying peptides originating from the at least one protein of interest and being capable of binding to MHC molecules of the particular haplotype.

17. The method of claim 16, wherein said protein of interest is natively expressed by the cells.

18. The method of claim 16, wherein said at least one protein of interest is expressed by the cells following transformation of the cells with nucleic acid encoding for said at least one protein of interest.

19. The method of claim 16, wherein said at least one protein of interest includes a tumor associated antigen.

20. The method of claim 16, wherein said at least one protein of interest includes a cytokine.

21. The method of claim 16, wherein said at least one protein of interest includes a protein of a pathogen.

22. The method of claim 16, wherein the soluble and secreted form of the MHC molecules include a polypeptide encoded by exons 5 to 8 of a murine mutant Q10^b.

23. The method of claim 16, wherein analyzing the peptides bound to the soluble and secreted form of the MHC molecules of the particular haplotype is by mass spectrometry, mass charge ratio and collision induced disintegration.

24. The method of claim 16, wherein identifying peptides originating from the at least one protein of interest and being capable of binding to MHC molecules of the particular haplotype is by comparison to a protein database.

25. An electronic data storage device, storing, in a retrievable form, a plurality of sequences of peptides identified by the method of claim 16.

26. A kit comprising a plurality of individual containers, each of said plurality of individual containers containing at least one peptide identified by the method of claim 16.

27. A method of identifying peptides originating from cancer associated proteins and being capable of binding to MHC molecules of a particular haplotype, the method comprising:

obtaining a cancer cell type expressing a soluble and secreted form of the MHC molecules of the particular haplotype;

collecting the soluble and secreted form of the MHC molecules of the particular haplotype;

analyzing peptides bound to the soluble and secreted form of the MHC molecules of the particular haplotype; and

identifying peptides originating from cancer associated proteins and being capable of binding to MHC molecules of the particular haplotype.

28. A method of identifying peptides originating from cells participating in the development and/or progression of an autoimmune disease and being capable of binding to MHC molecules of a particular haplotype, the method comprising:

obtaining cells participating in the development and/or progression of the autoimmune disease and expressing a soluble and secreted form of the MHC molecules of the particular haplotype;

collecting the soluble and secreted form of the MHC molecules of the particular haplotype;

analyzing peptides bound to the soluble and secreted form of the MHC molecules of the particular haplotype; and

identifying peptides originating from proteins participating in the development and/or progression of the autoimmune disease and being capable of binding to MHC molecules of the particular haplotype.

29. A method of identifying peptides originating from virus infected cells and being capable of binding to MHC molecules of a particular haplotype, the method comprising:

obtaining virus infected cells expressing a soluble and secreted form of the MHC molecules of the particular haplotype;

collecting the soluble and secreted form of the MHC molecules of the particular haplotype;

analyzing peptides bound to the soluble and secreted form of the MHC molecules of the particular haplotype; and

identifying peptides originating from the virus and being capable of binding to MHC molecules of the particular haplotype.

30. A method of identifying peptides originating from a particular cell type characterized by at least one of the following (i) cell over-expressing at least one protein; (ii) cells characterized by induced mutations; (iii) cells of metastases; (iv) normal or transformed cells expressing cell surface proteins, the peptides being capable of binding to MHC molecules of a particular haplotype, the method comprising:

obtaining cells of the particular cell type expressing a soluble and secreted form of the MHC molecules of the particular haplotype;

collecting the soluble and secreted form of the MHC molecules of the particular haplotype;

analyzing peptides bound to the soluble and secreted form of the MHC molecules of the particular haplotype; and

identifying peptides originating from the particular cell type and being capable of binding to MHC molecules of the particular haplotype.

31. An electronic data storage device, storing, in a retrievable form, a plurality of peptides being arranged at least according to their association with a pathology and further according to their ability of binding to MHC molecules of a particular haplotype.

32. An electronic data storage device, storing, in a retrievable form, a plurality of peptides being arranged at least according to their association with a protein of interest and further according to their ability of binding to MHC molecules of a particular haplotype.

33. A method of eliciting an immune response against a protein of interest in a subject having a particular MHC haplotype, the method comprising:

determining the subject's particular MHC haplotype; and

administering to the subject an effective amount of at least one peptide derived from the protein of interest and which is capable of binding to MHC molecules of the particular haplotype.

34. The method of claim 33, wherein administering to the subject the effective amount of the at least one peptide is accompanied by presenting the at least one peptide in context of an antigen presenting cell.

35. A method of treating a pathology by eliciting an immune response against a protein of interest in a subject having a particular MHC haplotype, the method comprising:

determining the subject's particular MHC haplotype; and

administering to the subject a therapeutically effective amount of at least one peptide derived from the protein of interest and which is capable of binding to MHC molecules of the particular haplotype.

36. The method of claim 35, wherein administering to the subject the therapeutically effective amount of the at least one peptide is accompanied by presenting the at least one peptide in context of an antigen presenting cell.

37. A peptide selected from the group consisting of SEQ ID NOs: SEQ ID NOs:4-6, 10-14, 19-21, 23-37, 44-88, 90-141, 143-144, 146-173, 175-189 and 191-195.

38. A pharmaceutical composition comprising, as an active ingredient, at least one of the peptides of claim 37, and a pharmaceutically acceptable carrier.

39. The pharmaceutical composition of claim 38, wherein said at least one of the peptides is presented in context of an antigen presenting cell.

40. A peptide selected from the group consisting of SEQ ID NOs: 5, 9, 10 and 25.

41. A pharmaceutical composition comprising, as an active ingredient, at least one of the peptides of claim 40, and a pharmaceutically acceptable carrier.

42. The pharmaceutical composition of claim 41, wherein said at least one of the peptides is presented in context of an antigen presenting cell.

43. A peptide selected from the group consisting of SEQ ID NOs: 13, 20, 23 and 24.

44. The peptide of claim 43, comprising at least one modification rendering peptides more stable in a body.

45. The peptide of claim 44, wherein said at least one modification rendering peptides more stable in said body is selected from the group consisting of peptoid modification, semipeptoid modification, cyclic peptide modification, N terminus modification, C terminus modification, peptide bond modification, backbone modification and residue modification.

46. The peptide of claim 43, comprising at least one modification rendering peptides more immunogenic.

47. The peptide of claim 46, wherein said at least one modification rendering peptides more immunogenic is selected from the group consisting of peptoid modification, semipeptoid modification, cyclic peptide modification, N terminus modification, C terminus modification, peptide bond modification, backbone modification and residue modification.

48. A pharmaceutical composition comprising, as an active ingredient, at least one of the peptides of claim 43, and a pharmaceutically acceptable carrier.

49. The pharmaceutical composition of claim 48, wherein said at least one of the peptides is presented in context of an antigen presenting cell.

50. A method of eliciting an immune response against a protein of interest in a subject, the method comprising:

using an individualized in vitro assay for determining an immune reactivity of an immune system of the subject to a plurality of peptides derived from the protein of interest; and

administering to the subject an effective amount of at least one peptide derived from the protein of interest and which is capable of inducing predetermined sufficient immune reactivity.

51. A peptide selected from the group consisting of SEQ ID NOs: 205-208, 210-225, 228, 230, 232-233, 235-236, 238-240, 242-244, 246-251, 253-255, 258-259, 261-262, 265-267, 270-271, 273, 277-279, 282, 284, 286-288, 291, 293, 301, 308, 311-313, 315-318, 322-323, 325 and 327-328.

52. A pharmaceutical composition comprising, as an active ingredient, at least one of the peptides of claim 51, and a pharmaceutically acceptable carrier.

53. The pharmaceutical composition of claim 52, wherein said at least one of the peptides is presented in context of an antigen presenting cell.

54. The peptide of claim 51, comprising at least one modification rendering peptides more stable in a body.

55. The peptide of claim 54, wherein said at least one modification rendering peptides more stable in said body is selected from the group consisting of peptoid modification, semipeptoid modification, cyclic peptide modification, N terminus modification, C terminus modification, peptide bond modification, backbone modification and residue modification.

56. The peptide of claim 51, comprising at least one modification rendering peptides more immunogenic.

57. The peptide of claim 56, wherein said at least one modification rendering peptides more immunogenic is selected from the group consisting of peptoid modification, semipeptoid modification, cyclic peptide modification, N terminus modification, C terminus modification, peptide bond modification, backbone modification and residue modification.

58. A peptide selected from the group consisting of SEQ ID NOs: 209, 225-227, 229, 231, 234, 237, 241, 245, 252, 256-257, 260, 263-264, 268-269, 272, 274-276, 280-281, 283, 285, 289-290, 292, 294-300, 302-307, 309-310, 314, 319-321, 324, 326 and 329-332.

59. A pharmaceutical composition comprising, as an active ingredient, at least one of the peptides of claim 58, and a pharmaceutically acceptable carrier.

60. The pharmaceutical composition of claim 59, wherein said at least one of the peptides is presented in context of an antigen presenting cell.

61. The peptide of claim 58, comprising at least one modification rendering peptides more stable in a body.

62. The peptide of claim 61, wherein said at least one modification rendering peptides more stable in said body is selected from the group consisting of peptoid modification, semipeptoid modification, cyclic peptide modification, N terminus modification, C terminus modification, peptide bond modification, backbone modification and residue modification.

63. The peptide of claim 58, comprising at least one modification rendering peptides more immunogenic.

64. The peptide of claim 63, wherein said at least one modification rendering peptides more immunogenic is selected from the group consisting of peptoid modification, semipeptoid modification, cyclic peptide modification, N terminus modification, C terminus modification, peptide bond modification, backbone modification and residue modification.

65. A peptide selected from the group consisting of SEQ ID NOs: 333-370.

66. A pharmaceutical composition comprising, as an active ingredient, at least one of the peptides of claim 65, and a pharmaceutically acceptable carrier.

67. The pharmaceutical composition of claim 66, wherein said at least one of the peptides is presented in context of an antigen presenting cell.

68. The peptide of claim 65, comprising at least one modification rendering peptides more stable in a body.

69. The peptide of claim 68, wherein said at least one modification rendering peptides more stable in said body is selected from the group consisting of peptoid modification, semipeptoid modification, cyclic peptide modification, N terminus modification, C terminus modification, peptide bond modification, backbone modification and residue modification.

70. The peptide of claim 65, comprising at least one modification rendering peptides more immunogenic.

71. The peptide of claim 70, wherein said at least one modification rendering peptides more immunogenic is selected from the group consisting of peptoid modification, semipeptoid modification, cyclic peptide modification, N terminus modification, C terminus modification, peptide bond modification, backbone modification and residue modification.